a8 amd

electrical conductors and the step of weaving the wrapped thread at the selected location comprises weaving the multiple wrapped threads at a single shed or course in the cloth.

a7

6. (Amended) The method of claim 3 and further comprising, after wrapping the selected thread with an electrical conductor and before weaving the wrapped thread at the selected location in the cloth, the step of treating the wrapped thread with a first substance to render the wrapped thread relatively impervious to a second substance, and then, after weaving the wrapped thread at the selected location in the cloth, the step of treating the cloth with the second substance.

a10

21. (Amended) The moving coil transducer of claim 3.

Please cancel claims 22 and 24-27 without prejudice.

REMARKS

This application is a division of U. S. S. N. 08/755,578 filed November 13, 1996. U. S. S. N. 08/755,578 is a continuation of U. S. S. N. 08/219,117 filed March 29, 1994, now abandoned. These amendments are being made to conform this application to the current state of U. S. S. N. 08/755,578, which is now allowed, and to cancel from this application claims allowed in U. S. S. N. 08/755,578.

Accordingly, Applicants submit that this application is now in condition for favorable consideration, culminating in allowance. Such action is respectfully requested.

Respectfully submitted,

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Marked up copies of paragraphs of application showing changes

There are several proposals in the prior art to incorporate into the spiders of such loudspeakers the conductors to the loudspeaker voice coil. There are, for example, the disclosures of U.S. Patents: 1,906,066; 1,906,379; 1,907,687; 2,221,068; 2,538,621; 2,922,850; 3,014,996; 3,079,471; 4,313,040; 4,565,905; 5,008,945; and, 5,091,958: United Kingdom patent specifications 638;080 and [686,984] 686,934: German patent specification 3,511,802: and Japanese patent applications: 59-259,547; 61-137,498; 62-155,851; 64-897; 1-295,599; 2-241,297; and, 3-208,497. This listing is not intended as an exhaustive listing of the prior art, nor as a representation that no more pertinent prior art exists, nor should any such representation be inferred.

The flexible conductors[, in the form of] 66 are applied to individual parallel strands 60 as illustrated in Figs. 3a-b[, or] which may then be formed into twisted cord 62 as illustrated in Figs. 4a-b, and are an integral part of the warp or weft of the cloth and serve as substitutes for a shed or course of the normal yarn. In either of these embodiments, all of the conductors in each of the two paths are confined to a single shed or course 64 to facilitate connection to the voice coil and loudspeaker terminals. Weaving the flexible conductors 66 as part of the cloth is superior to adding the conductors in a later operation, because conductors 66 woven into the cloth are at the flex locus, rather than on the surface as in the case of conductors later stitched, adhered or otherwise applied to a cloth surface. The flexible [conductive strands] foil conductors 66 are formed from very thin conductive foil fabricated from copper, copper alloy, or silver plated copper alloy. Each of these conductors 66 is helically wrapped around a fiber core 68. The core 68 absorbs the physical stresses applied to the conductive assembly 62 and 65. The helical configuration of the [foil] conductors 66 permits the [foil] conductors 66 to withstand additional flexure without significantly stressing the [foil] conductors 66.

The illustrated embodiments of the flexible [conductors] conductive assemblies 62 and 65 contemplate seven conductive strands 60 laid in a single shed 64 (Figs. 3a-b) or twisted together (Figs. 4a-b) to form a conductive cord 62. The multiple strands provide the total conductivity needed to minimize heating of the conductive cord 62 or 65 due to power dissipation in the cord 62 or 65. The twisting together of the multiple strands further improves

the flex life of the conductive assembly by increasing the length of conductive foil 66 per unit length of the conductive cord 62. Thus, the forces induced by flexure are distributed over a longer [conductive] foil conductor 66, reducing the forces per unit length of [conductive] foil conductors 66.

Because the conductive cord 62 is an integral component of the base cloth 70, it will tend to become saturated and coated with phenolic resin when the cloth 70 goes through the impregnation process. To maintain solderability of the foil conductors 66, and to retain the natural flexibility of the conductive cord 62 after the cloth 70 is impregnated with phenolic, the conductive cord 62 is coated with wax prior to weaving it into the cloth 70. This can be accomplished, for example, as the final in-line process in the fabrication of the conductive cord 62. This wax will be dissipated in the high temperature spider 40 molding process, leaving the conductive [surface] foil 66 ready for interconnection.

After the cloth 70 containing the foil conductors 66 is woven, it is impregnated with a thermosetting phenolic resin diluted with a solvent. The cloth 70 is then dried in a warm air oven to flash off the solvent, leaving a dry, tack free surface.

After the conductive adhesive 41 is applied to the wires 43, the spider 40 is positioned with the conductive cords 62 over the conductive adhesive 41. The conductive adhesive 41 forms a small conductive fillet between the voice coil wires 43 and the flexible conductors 62 in the spider 40. A second, electrically non-conductive adhesive 80 is applied around the entire junction of the spider 40 and coil former 82 to join the spider 40 to the coil former 82. This adhesive 80 can be applied right over, and cured at the same temperature and time required to cure the conductive adhesive 41. Adhesive 80 has substantially no effect on the proximity, placement, or cure of the conductive adhesive 41. After the adhesives 41, 80 are applied, they are cured, thus completing an electrically conductive spider 40/voice coil 84 assembly. The spider 40/voice coil 84 assembly is then mounted into the loudspeaker using conventional techniques such as, for example, non-conductive adhesives, with care being taken to prevent the [flexible conductors] conductive cords 62 from being shorted to the frame 90.

The use of the conductive adhesive 41 eliminates the aforementioned problems related to the common practice of soldering this joint. The conductive adhesive 41 provides an

effective structural joint with the components 40, 82 it joins. The conductive adhesive 41 also readily bridges and joins to the cores 68 of the [flexible conductors] conductive cords 62. Conductive adhesive 41 also eliminates the flux contamination typical with conventional soldering techniques.

The invention thus provides: a method of preparing a loudspeaker with woven 70, integral, multistrand 60, [tinsel] foil 66 conductive cords 62 as the flexible conductors required to connect the voice coil 84 to the loudspeaker terminals 88; a loudspeaker spider cloth 70 with woven, integral, multistrand 60, [tinsel] foil 66 conductive cords 62 as the flexible conductors required to connect the voice coil 84 to the loudspeaker terminals 88; a loudspeaker spider cloth 70 wherein the woven, integral, multistrand 60, [tinsel] foil 66 conductive [strands] cords 62 are grouped together in a single shed 64; a method of interconnecting the voice coil wires 43 and the flexible foil conductors 66 within the spider 40 using a conductive adhesive 41 to provide both the electrical and mechanical connections; and, a method of preserving the surface condition and flexibility of the integral flexible foil conductors 66 as the cloth 70 is impregnated with phenolic resin by treating the flexible foil conductors 66 with a wax coating as part of the fabrication process of the conductive [strands] cords 62.